CULTURAL BOUNDARY SPANNING IN GLOBAL PROJECT NETWORKS
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ABSTRACT
Projects are increasingly global in scope and outsourcing on projects increasingly common. Along with globalizing trends in projects, the workforce is also globalizing. It is common for engineers to move to other countries as expatriate workers or as emigrants to pursue job opportunities in other firms. Where much is known about global networks of engineers collaborating on projects, little is known about the mediating role played by individuals that share the same nationality as an international partner on a project. In this paper, we examine two project teams executing complex, reciprocally interdependent design projects in India. One team was comprised of Indians and Americans. The other team was identical, but also contained an Indian national who had studied and worked in the U.S.A. Both teams worked on similar design schedule optimization problems. Over the duration of three days we examined the interactions of the teams assembled to finalize their designs. Through quantitative network analyses and qualitative observations of the cross-cultural interactions, we found the Indian expatriate to play a cultural boundary spanning role resolving cross-cultural knowledge system conflicts and increasing collaboration effectiveness. We induce a propositional theoretical model of cultural boundary spanning in global project networks.

KEYWORDS: Boundary spanning, cultural issues, globalization.

INTRODUCTION
As the engineering workforce globalizes, a growing number of engineers have lived and worked in multiple countries and can speak multiple languages (Haas 2006). As differences between the cultural origin of individuals and that of the country in which they are working emerge, conflicting culturally dependent perceptions can create boundaries dividing members of an engineering team (Cramton and Hinds 2005). These boundaries become increasingly important for companies that offshore work to other countries requiring cross-cultural engineering teamwork. This is particularly challenging in engineering services delivery where global project networks of firms deal with a myriad of task, specialization, resource and other boundaries in the execution of complex, reciprocally interdependent projects (Bryant 2006, Chan and Tse 2003, Kini 2000, Nayak and Taylor in press). Researchers have shown that the differences in cultural contexts are still present in offshore collaborations and from these differences boundaries are created that can prohibit knowledge transfer (Chen et al. 2009, Levina and Vaast 2008, Ozorhon et al. 2008).

For global engineering project networks, complex design knowledge must be exchanged frequently and iteratively. Researchers have identified the critical role that boundary spanners can play in increasing the efficiency of knowledge exchanges across teams and organizations (Cross and Prusak 2002, Levina and Vaast 2005, 2006). Others have argued that it should be the

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role of the management within globally distributed organizations, not the individuals, to integrate
the culturally diverse team members within the organization (Miller et al. 2000, Porter 1995). If
spanning cultural boundaries is a critical competence in effective offshoring of complex work,
then we need further research on cultural boundary spanners to understand how they emerge and
how they can enhance global project success.

BACKGROUND

Weak interpersonal relationships in culturally diverse teams will impede adequate
knowledge exchange processes within teams (Luo 2001). The success of cross-cultural
collaborative engagements requires another form of team participant than just the team leader
(Ansett 2006). Luo (2001) concluded that because members with varying cultural backgrounds
find it difficult to communicate within cross-cultural joint ventures, having a number of
culturally related group members allows for seamlessness in coordination and communication.
To adapt to the globalizing cross-cultural team working environment, many firms have chosen to
designate some team members to bridge the gap between team members with different
backgrounds (Cross and Parker 2004). Adopting this practice is in line with the suggestion that
organizations should appoint certain persons to span boundaries between units (Aldrich and

In a recent study, Levina and Vaast (2008) studied offshore collaboration in information
systems development and found that a middle manager on the onshore team can act as a
boundary spanner to mediate the negative effects arising from status and cultural differences.
However, research on the actual effectiveness of cultural boundary spanners in global networks
of firms has been limited, and the results have been somewhat mixed. Luo (2006) examined
boundary spanning leadership decision-making effectiveness in global joint ventures and found
that the boundary spanner played a role in suppressing the negative influence of national cultural
differences in interparty attachment, but not in reducing conflict. Friedman and Podolny (1992)
concluded that it is not clear whether nominating persons to boundary spanning positions
actually leads to effective boundary spanning.

In settings where cross-cultural conflicts are expected, a key boundary to be spanned is at
the boundary between cultures. Cultural boundary spanners should possess the knowledge to
renegotiate the cultural boundaries that develop. Thus, we define a cultural boundary spanner in
cross-cultural project networks as a member of the project team that provides vital cultural
insight and background that the entire network draws on to get its work done. We further specify
that cultural boundary spanners can be any team members who connect the members of
culturally distinct sub-teams in project networks through their knowledge of the collaborative
counterparts’ backgrounds. Despite the importance of spanning cultural boundaries in global
project networks, researchers have largely ignored the emergence and role of a cultural boundary
spanner in cross-cultural collaborations. In this manuscript we examine how individual actors
resolve conflicts in cross-cultural engineering services project networks by spanning boundaries.
We ask how does a cultural boundary spanner emerge in cross-cultural project networks and
how does the emergence influence the effectiveness of cross-cultural engineering services work?

RESEARCH SETTING AND METHODS

To capture the interactions and role of cultural boundary spanners in complex cross-
cultural project execution, we observed two cross-cultural project teams. Researchers have
described the need to carefully design empirical studies of global teams to avoid as much as
possible the interacting effects of other boundaries (Espinosa et al. 2003). For this purpose, we used two graduate student teams (hereafter Team 1 and Team 2) composed of engineering students with engineering work experience from two universities, one in India and one in the United States. Both teams had nine members. Both cross-cultural engineering services networks were divided into two sub-teams: one sub-team composed of American engineers and one sub-team composed of Indian engineers.

Both teams were required to work together in a task interdependent project network to complete the computer-aided design (CAD) and organizational models required to schedule a complex design project. In both teams, the sub-team composed of Americans was responsible for developing an organizational simulation-based construction schedule and the Indian sub-team was responsible for developing a 3-D CAD model based on a set of existing plans and drawings. The synchronization of the models resulted in a 4-D CAD model with the simulated schedule produced by the U.S. sub-teams. Time-space conflicts identified in the 4-D CAD model required further changes in the schedule which were then re-examined in the organizational simulation model and input again into the 4-D CAD model. The key difference between the two teams was that Team 1 contained an Indian expatriate (hereafter referred as a cultural boundary spanner, or CBS) living in the U.S. as part of the U.S. team. He was born and raised in India but had moved to the U.S. in order to complete his engineering studies and following his undergraduate studies emigrated to the U.S. Involving a team member with significant experience in both sub-team cultures enabled us to observe whether and how cultural boundary spanning would occur.

Three days of face-to-face meetings took place in Chennai, India in May 2008. The meetings lasted between 2 and 5 hours. The discussed topics included the coordination of both teams’ interdependent design schedules, the design and implementation of interventions to optimize the schedule, and the completion of a final report and presentation of the results. During these meetings, we observed the intra-cultural and cross-cultural communication and recorded all interactions between teams. Here, we define interaction as a two-way communication between two individuals. We used both audio and video recordings, and the recordings were later transcribed into text for further analysis. To identify if cultural boundary spanning emerged in either team, we used organizational network analysis (ONA). ONA is a quantitative research method that can be used in mapping out and identifying the flow of information and network relationships in a graphical form (Cross and Parker 2004). Chinowsky and colleagues (2008) describe ONA as a valuable method for studying patterns in construction and engineering teams.

The ONA generates values between 0 and 1 (1 being the most important and 0 being the least) for three measures of positions for individuals or ‘links’ within the network. These include; degrees of centrality (CD), which is the measure of the overall importance of the link in order to transfer information; betweenness centrality (CB), which is the measure by which one link mediates between other vertices; and closeness centrality (CC), which is the measure of the total distance between one vertex and all other vertices. It is important to note these values in order to determine which actor within cross-cultural collaborations ‘bridge the gap’ between the unconnected participants, in our case the U.S. and Indian sub-teams. The output for all the defined values (CD, CB, CC) was calculated for each individual, at an aggregate level for each network of sub-teams, and for each day. These values are included in Figures 1, 2 and 3, along with ONA diagrams of the communications for the period indicated. The centralization values for the entire network are also displayed under the network diagrams of the respective figures. The thickness of the node-connecting links that can be observed from the communication network diagrams at the top of Figures 1, 2 and 3 represent amount of interaction. The
communication network sociograms of the collaborative interaction patterns enabled us to examine whether the cultural boundary spanner emerged as central.

**CULTURAL BOUNDARY SPANNER EMERGENCE**

During the first day of cross-cultural sub-team interactions, the team member who had been facilitating communications between the teams prior to the face-to-face interactions was the most central individual in both Team 1 and Team 2. This is represented in communication network diagrams in Figure 1 where sub-team member US3 in Team 1 and member US5 in Team 2 are the most central on the U.S. sub-teams. These individuals are the most dominant in terms of degrees of centrality and tie strengths for the first day. For Team 1 in particular, US3 is the main link of information flow. The cultural boundary spanner (CBS) interacts with all the team members at least once, especially with his Indian counterparts, on the first day of team interaction, despite his overall low degree of centrality (0.750). The CBS’s involvement steadily increased during the course of the first day. The communication network diagrams illustrate sparse communication spanning cross-cultural boundaries across sub-teams in Team 2. In Team 2 there was limited cross-cultural interaction during the entire first day. All but one cross-cultural communication occurred between US5 and I6. Individual centrality measures below the communications network diagrams in Figure 1 indicate that each sub-team member on Team 2’s individual closeness centrality and betweenness centrality is on average less than that of Team 1.

![Figure 1 - Team 1 and Team 2 Interactions on Day 1](image)

In day 2, Team 1’s cultural boundary spanner (CBS) emerged as the most central individual within the communications network with a degree of centrality and betweenness of 1.00, as well as the highest closeness centrality in the team of 0.589. This is illustrated in the communication network diagram in Figure 2. The high degrees of centrality and betweenness are due to the fact that the ties are very strong with the Indian sub-team counterparts and there were a large number of communications. It is also important to point out that not only is the cultural
boundary spanner the most central individual in the communication network, but that the other individuals’ centralities were reduced as he emerged to become the central link of communication. The cultural boundary spanner is not only the most communicating actor in the network, but is also the go-between within the network for information and the closest to all other team members. The network diagram of Team 1 also demonstrates a number of strong ties that span cross-cultural sub-team dyads that do not pass through CBS. US3 continues to interact with all the team members, but the strength of ties spanning to and from US3 are much weaker.

Team 2’s most central team member also changed from day 1 to day 2. The individual centralities of Team 2 are weak; with even the most central link (US5) only exhibiting approximately 71% of full centrality. This indicates there is no single individual who coordinated communication. The network centralization of Team 1 is greater than that of Team 2 due to the high centrality of the CBS. Team 2’s network centralization is lower because of the lack of a central team member. It is noteworthy that there is also an increase in cross-cultural interactions from day 1 to day 2, as clearly both sides needed to collaborate to execute the interdependent modeling task. Nevertheless, the tie strengths in Team 2’s cross-cultural communications remain relatively weak compared to within sub-team, intra-cultural communication.

In day 3, the final day of team interactions and the day that the teams presented their engineering solutions, we again observed contrasting communication network results. Team 1’s network diagram, contained in Figure 3, reveals all the participating team members were equally central (\( C_D = 1.00 \) & \( C_B = 1.00 \)) for all members in reference to one another. Each team member also demonstrates the same amount of interactions to all other members of their team. The closeness centrality for this team is zero because no member exhibits closer ties in reference to all other members in the team, another display of their equality. Because there are no node differences in reference to the team, the overall network centralities are also zero as there are no deviations. Team 1, by the end of day 3 became a fully integrated team. All members in Team 1
communicated as equal stakeholders to the final joint development effort of their project. Note that team member US3 was not present during these interactions due to the fact that she took on a relatively isolated role in the preparation of the final project presentation. On day 3, team member US5 was most central in Team 2, however, there was little cross-cultural sub-team evidence of group cohesion. Like on day 2, on day 3 no one member exhibited full centrality in the communication network. The highest degree centrality was US6 with only 80% centrality. No single team member took the initiative to interact with all members of the project team.

![Figure 3 - Team 1 and Team 2 Interactions on Day 3](image)

**THE EMERGENT ROLE OF CULTURAL BOUNDARY SPANNERS**

The communication network diagrams illustrate how a cultural boundary spanner moved from a peripheral role in day 1 to a central role in day 2. We also observe that the communications of the team with the benefit of the cultural boundary spanner achieved equilibrium in communication across all members of the team by day 3. Team 2, who did not have the benefit of a cultural boundary spanner, was unable to establish consistent communication across the cross-cultural sub-teams and members of the team became more isolated by day 3. This demonstrates quantitatively that a cultural boundary spanner can become a central actor in a complex engineering cross-cultural project network. However, it provides little detail to explain how that emergence occurred. In this section we examine the content of Team 1’s communications in order to understand how this peripheral actor in the network emerged as central and how that may have led to equilibrium in communications.

Following the lead of other researchers of cross-cultural and international interactions (Hinds and Bailey 2003, Mahalingam and Levitt 2007), we focused our analysis on how the team addressed conflicts or difficulties that arose during the interaction. These difficulties included a large number of national cultural conflicts that originated from discrepancies in knowledge at the level of national-cultural systems. We labeled these as knowledge system conflicts. These
knowledge discrepancies were not created by differences in individual-level variables such as level or type of education, age, profession, or language, but rather from the different customs, norms and institutions in the U.S. and India. We then focused our analysis on how these conflicts were addressed by the cultural boundary spanner or other members of the team to span the cross-cultural boundary and address the knowledge system conflicts that emerged.

During the team face-to-face meetings, the conflicts we identified between the U.S. and Indian sub-teams were largely a function of the national cultural boundary that separated them. The cultural boundary present was an obstacle that both Team 1 and Team 2 had to mediate in order to collaborate effectively and complete their complex, task-interdependent engineering modeling project. In many cases conflicts arose due to unfamiliarity with linguistic and work practice norms. Such conflicts emerged in day 1 for both Team 1 and Team 2. As both teams attempted to begin the task interdependent design of interventions required for the project, the accumulation of these conflicts caused the formation of the national cultural boundary early in the first day of the collaborative process. This finding is in line with previous literature that argues that differences in national cultural backgrounds often lead to the emergence of national cultural boundaries (Espinosa et al. 2003, Levina and Vaast 2008, Ozhorhon et al. 2008). This leads us to formulate the following propositions:

**Proposition 1**: Differences in national cultural backgrounds give rise to national cultural boundaries which lead to the emergence of knowledge system conflicts.

**Proposition 2**: Knowledge system conflicts reduce collaboration effectiveness.

We were specifically interested in exploring how the cultural boundary spanner’s role led to collaboration effectiveness as evidenced by the equilibrium of communications from the day 3 communication network. We found that the cultural boundary spanner consistently emerged (in both English and in the regional Indian language Tamil) to mediate the majority of the identified knowledge system conflicts. Toward the end of day 2 another cultural boundary spanning process was observed. Team members other than the nominated cultural boundary spanner began to take the initiative to address knowledge system conflicts and, although the resolution to these conflicts was less efficient, two other members of the Team 1’s sub-teams (one U.S. and one Indian) emerged as cultural boundary spanners in practice. This appeared to be triggered by the successful earlier knowledge system conflict resolution by the CBS that the team observed.

Our data suggests that both nominated and emergent cultural boundary spanners can mediate the effect of knowledge system conflicts on collaboration effectiveness at national cultural boundaries. This suggestion is in line with existing research on boundary spanning emergence: for example, Levina and Vaast’s (2005) analysis shows how a nominated boundary spanner was able to encourage the boundary spanning emergence. As the other team members within Team 1 became more accustomed to spanning boundaries created by the differences in their national cultural backgrounds, the number and severity of conflicts reduced significantly. This process contributes to an explanation of how Team 1 achieved communication network equilibrium over the three days of interaction. This leads to the following propositions:

**Proposition 3**: Nominated cultural boundary spanning is a managerial practice that can directly mediate the effect of knowledge system conflicts on collaboration effectiveness.

**Proposition 4**: Nominated cultural boundary spanning is a managerial practice that can enable cultural boundary spanning in practice to emerge.
**Proposition 5:** Emergent cultural boundary spanning in practice is a managerial practice that can mediate the effect of knowledge system conflicts on collaboration effectiveness.

**MODEL OF CULTURAL BOUNDARY SPANNING IN GLOBAL PROJECTS**

When cultural boundaries were crossed it can lead to cross-cultural knowledge system conflict. In order for cross-cultural engineering teams to collaborate effectively, these teams need members who can span boundaries and thus mitigate knowledge system conflicts, particularly during team formation. Research to date on boundary spanning has not explored how these cultural boundary spanners emerge. Our exploration of cultural boundary spanner emergence finds that differences in national cultural backgrounds give rise to national cultural boundaries (P1). These boundaries result in knowledge system conflicts (P2) that are detrimental to collaboration performance. Recent research on global collaborations also supports this argument (Bryant 2006, Levina and Vaast 2008, Mahalingam and Levitt 2007). We find that when potentially detrimental knowledge system conflicts occur, nominated cultural boundary spanners can mitigate them by negotiating boundaries (P3) and thus forming new “joint fields” that enable team members from different national cultural backgrounds to pursue common goals (Levina and Vaast 2005:337). The concept of joint field creation is of strategic importance. Dyer and Song (1997) argue that successful management of global conflicts can lead to competitive advantage.

Our findings indicate that the nominated cultural boundary spanner can positively influence team performance by triggering other team members to assume boundary spanning roles (P4). We further proposed that the emergent cultural boundary spanner has a positive effect on management practice through negotiating boundaries and thus reducing knowledge system conflict (P5). Extending Levina and Vaast’s (2008) process-oriented findings of managerial practices as boundary mediators, we conclude that in global engineering project networks where national cultural boundaries are present, the combination of both nominated and emergent boundary spanners constitutes a key managerial practice. Finally, because managing cultural boundaries in global project networks and successful team coordination has a positive relationship to collaboration effectiveness, we assert that managerial practice composed of both nominated and emergent boundary spanners leads to higher performance in global cross-cultural teams. A propositional theoretical model of cultural boundary spanning in global project networks to achieve collaboration effectiveness is shown in Figure 4.

![Figure 4 - Model of Cultural Boundary Spanning in Global Project Networks (Extending the Levina and Vaast (2008) Model of Social Boundary Impact on Collaboration Effectiveness)]
LIMITATIONS

The teams studied consisted of individuals participating in a project for a graduate level course, not working in an industrial setting. This imposed limitations in the research in that teams in a class setting are motivated by their grade results as opposed to monetary or professional recognition they could receive when working in a multinational project network. It is important to note, however, that the graduate students participating in the projects were either part-time students at present working in design or construction firms or full-time students with several years of prior professional experience. This enabled all team members to act professionally towards the project assignment and to be knowledgeable about the design and construction systems involved in the two projects. Moreover, the projects the two teams investigated were real current projects on which one of the team members was working. The findings fundamentally demonstrate the impact a cultural boundary spanning team member has on the collaboration effectiveness of a cross-national network of firms or individuals engaged in a complex interdependent task. Researchers have demonstrated that laboratory studies can increase theoretical understanding of organizational phenomena and therefore the results of such research can be generalized to broader industrial settings (Dobbins et al. 1988). Our findings establish a baseline understanding for future research and observations of collaboration in global project networks.

CONCLUSIONS

The research and propositional theoretical model presented in this paper extends the literature on boundary spanners by demonstrating that the relationship between nominated and emergent boundary spanners is more complex than the existing literature suggests. Both types of boundary spanners are needed for cross-cultural engineering services project collaboration effectiveness, but nominated boundary spanners are particularly important because they can trigger emergent boundary spanning processes. The contribution of this research lies in demonstrating the centrality of and facilitation role a cultural boundary spanner can play in a cross-cultural project network. However, it is not clear what characteristics of individual boundary spanners may allow them to take this role. Further research is needed to characterize the boundary spanners that emerge unexpectedly in practice in global projects and to quantify the impact on performance when cultural boundary spanning occurs.

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